

SP-W9 Project Effects on Natural Protective Processes

October 25, 2002

1.0 Introduction/Background

The natural protective processes of a riverine system are a complex and, in many cases, overlapping array of interactions of the river's waters with the biological and physical structure around it, including the riparian zone (and adjacent wetlands) and in-stream riffles. To adequately describe the potential project effects on these complex processes, an ecosystem level approach is necessary. Therefore, while developing new studies, this study cooperates with and incorporates data from related geology, terrestrial, and water quality studies. This study will evaluate the potential effects of the project on the functions of the riparian and wetlands resources along the Feather River and the riffle-pool complex within the Feather River.

2.0 Study Objective

The objective of the study is to determine the effect of the project on natural protective processes that affect water quality of those areas adjacent to and under the influence of project waters. This study will provide information to be used to identify potential protection, mitigation and enhancement measures.

3.0 Relationship to Relicensing/Need for the Study

The study will be used to demonstrate the post-project effectiveness of natural protective processes on biological, physical, and chemical integrity of waters within the project area. The United States Fish and Wildlife Service (USFWS) and the National Marine Fisheries Service (NMFS) require this information to determine project effects on the habitat of listed species, including salmon and steelhead.

4.0 Study Area

The Study Area includes waters and lands within the project boundary, and along the Feather River within the levee system, if present, or the extent of the riparian/wetland vegetation, whichever is greater, downstream to the Sacramento River.

Study plans approved by the Environmental Work Group define the limits of the study area. If initial study results indicate that the study area should be expanded or contracted, the Environmental Work Group will discuss the basis for change and revise the study area as appropriate.

5.0 General Approach

This study will evaluate project effects to natural water quality protective processes in riparian and wetland areas as Task 1 and riffle areas as Task 2. If initial study results indicate that the methods and

tasks should be modified, the Environmental Work Group will discuss the basis for change and revise the study plan as appropriate.

Task 1—Riparian and Wetland Areas

The riparian areas, which include adjacent wetlands, of rivers and lakes perform a variety of natural protective processes, primarily through the filtration and uptake of nutrients, minerals, and other water-borne constituents, by vegetation. These areas are fed by the adjacent river during higher stages, and subsequently recharge the river during lower stages. The quality of this recharge, therefore, affects the quality of the water in the river. Riparian areas also shade the river's waters in many areas to reduce or maintain cooler water temperatures. Sediments, especially fine material, are deposited in these areas. These areas also tend to have the highest densities and diversity of wildlife and fisheries, which depend on these areas as rearing grounds, cover, food supply, and for other biological functions.

Literature will be reviewed to document the known effects of riparian areas on water quality, and will be used to help evaluate the relation between changes in riparian areas and water quality. Information about changes in riparian areas from ongoing or potential changes in project operations will be obtained from Study Plan SP-T3/5. Water quality information will be obtained from Study Plan SP-W1 for the Feather River and SP-W5 for ponds in the Oroville Wildlife Area. Information from these sources will be used to evaluate potential effects to water quality from changes or potential changes in the riparian vegetative communities. If additional information is needed for this determination, including site-specific data collection and analyses, a subsequent phase will be proposed to the Environmental Work Group for concurrence.

Task 2—Riffle Areas

Riffles are the primary re-oxygenators of waterways, while also serving as spawning grounds and cover for various fishes, including salmonids, and habitat for macroinvertebrates. The oxygenation process in riffles also plays a significant role in the reduction of nutrient and mineral loading in a riverine system. Riffles are sensitive to water level fluctuations and loss of gravel recruitment. Without sufficient flow, movement of cold water, oxygen, and nutrients into and through riffles and removal of biological waste products are reduced.

Published literature will be reviewed for known effects of riffle areas on protection and improvement of water quality, factors that decrease those natural protective processes, and water quality conditions needed for successful salmonid egg and alevin survival. Under Study Plan SP-G2, pools, riffles, and runs will be mapped and compared to historical maps to assess the extent of change. Study plan SP-G2 will also analyze sediment composition of riffles, which affect the rate of water flow through the interstices. Several of the mapped riffles will be included in water quality Study Plan SP-W1, which will measure dissolved oxygen, temperature, conductivity, pH, and other parameters in the water column, and analyze aquatic macroinvertebrate communities. This study plan will measure dissolved oxygen, water temperature, conductivity, and pH within the riffle gravels with calibrated meters and probes at the mapped riffles monitored for water quality in Study Plan SP-W1. Ammonia, a product of the breakdown of organic matter that may affect salmon egg and alevin survival, will be sampled from the interstitial waters through aspiration. Study Plan SP-F10 indicates that incubation in gravels of eggs and alevins of Chinook salmon and steelhead trout occurs from mid August through March and December through June, respectively. Therefore, interstitial water quality will be measured throughout the year at monthly intervals, and more frequently (i.e., twice monthly) if water quality

conditions are identified that may affect egg or alevin survival. Riffle areas cleansed by spawning salmonids and areas uncleansed will be sampled. This study will use this data to determine the effects of the project on the natural protective process of riffles in oxygenation, waste product removal, and other protective processes in the Feather River.

Task 3. Progress Report

A progress report will be prepared at the conclusion of the first year of study. Interim output products will be identified through coordination with other workgroups to meet their data needs.

Task 4. Final Report

A final report will be prepared following completion of the study.

6.0 Results and Products/Deliverables

Results

Information from this study will be evaluated to determine if there is any effect from the project to the natural protective processes that maintain and improve water quality in the Feather River system. The effects of the project to natural water quality protective processes in riparian areas will be assessed through a literature review of the affects of riparian areas on water quality and evaluation of changes in riparian quality and extent. Additional sampling may also be conducted for site-specific data.

Results of the literature review, riffle sediment assessment from Study Plan SP-G2, and the macroinvertebrate and water column water quality assessments from Study Plan SP-W1 will be used with additional information collected from this study to evaluate effects to natural water quality protective processes of riffles. Species richness and diversity will be calculated from the macroinvertebrate data from SP-W1 for an indication of water quality conditions and health of the invertebrate community. Water quality variables in the water column will be compared to those present in riffle gravels to evaluate the cleansing ability of the riffles. Sediment data will be used with available literature to evaluate effects to flow of water through riffle gravels and removal of metabolic waste products. These analyses will be used to evaluate potential project effects on the natural protective processes of water quality in riffle areas in the Feather River.

Products/Deliverables

The following products will be developed for this study:

- Progress Report
- Final Report

7.0 Coordination and Implementation Strategy

Coordination with Other Resource Areas/Studies

Mapping of riparian and wetland areas will be performed under Study Plan SP-T3/5, while riparian habitat quality will be obtained from Study Plan SP-T1. Physical, chemical, and biological components of water quality from the water column will be obtained by Study Plan SP-W1. Riffles will be mapped and sediments sampled in Study Plan SP-G2. If any issues arise during the duration of this study or other studies that are directly related to the natural protective processes for water quality, an amended study plan will be proposed in coordination with the Environmental Working Group and Task Force.

Issues

This study plan provides the information for evaluation of Issue Statement W18 (Effect of existing and future project facilities and operations on natural protective processes (e.g., marshes)), and will provide information for determination of project compliance with water quality standards and other appropriate requirements in the application for water quality certification. This study fully or partially addresses the following Stakeholder issues:

Stakeholder issues fully addressed by SP-W9 Project Effects on Natural Protective Processes

- WE9. Encourage natural protective processes

Stakeholder issues partially addressed by SP-W9 Project Effects on Natural Protective Processes

8.0 Study Schedule

The literature review to determine the role of riparian and wetland areas in natural protective processes will commence in early 2002 and should be completed by fall of 2002. Subsequently, information about changes in riparian areas from Study Plan SP-T3/5 and water quality data from Study Plans SP-W1 and SP-W5 will be used to evaluate project effects to natural water quality protective processes of riparian and wetland areas along the Feather River. Sufficient information from these study plans to begin this evaluation is not expected until the spring of 2003. The initial evaluation should be completed by the summer of 2003. If initial evaluation indicates the need for site-specific data collection, an amended study plan will be presented to the Environmental Work Group for concurrence. A final report is expected to be completed by mid 2004. The literature review to evaluate the effects of riffles to natural water quality protective processes will begin in the spring of 2002. Water quality data collection will commence in the spring of 2002, in conjunction with data collection for Study Plan SP-W1. A Progress Report will be submitted at the end of the first year, and at the end of all subsequent years. A Final Report will be submitted at the end of the study for the relicensing process. Interim results will be provided to the water quality, terrestrial, and fisheries work plans, as necessary.